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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/785,445	02/20/2001	Lu You	50432-022	5047

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EXAMINER

VU, HUNG K

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 08/28/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/785,445

Applicant(s)

YOU ET AL.

Examiner

Hung K. Vu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 19-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Invention I, Claims 1-18, in Paper No. 7 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Applicant's election without traverse of Invention I, Claims 1-18, in Paper No. 7 is acknowledged.

Claims 19-30 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 7.

Claim Objections

2. Claim 15 is objected to because of the following informalities: In claim 15, line 2, "includes" should be changed to "include" for clarity. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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Claims 1-3, 5, 9-12, 14-15 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Huang (PN 6,156,648).

Huang discloses, as shown in Figure 2F, a semiconductor device comprising,

- a first metallization layer (202);
- a first diffusion barrier layer (204) disposed over the first metallization layer;
- a first etch stop layer (208) disposed over and spaced from the first diffusion barrier layer;
- a dielectric layer (210) disposed over the first etch stop layer;
- a via extending through the dielectric layer, the first etch stop layer, and the first diffusion barrier layer.

With regard to claim 2, Huang discloses the device further comprising a second etch stop layer (206) disposed between the first diffusion barrier layer and the first etch stop layer.

With regard to claim 3, Huang discloses the second etch stop layer includes silicon oxide.

With regard to claim 5, Huang discloses the device further comprising a sidewall diffusion barrier layer (218a) disposed on sidewalls of the via.

With regard to claim 9, Huang discloses the device further comprising a second diffusion barrier layer (228) disposed over the sidewall diffusion barrier layer.

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With regard to claim 10, Huang discloses the dielectric layer includes silicon oxide.

With regard to claim 11, Huang discloses the metallization includes copper.

With regard to claim 12, Huang discloses the device further comprising a conductive plug disposed with the via, and wherein the conductive plug includes copper.

With regard to claim 14, Huang discloses a semiconductive device comprising,

- a first metallization layer (202);

- a dielectric layer (206,210) disposed over the first metallization layer, the dielectric layer defining a via extending through the dielectric layer to the first metallization layer;

- a first sidewall diffusion barrier layer (218a) formed from a first material disposed on sidewalls of the via;

- a second sidewall diffusion barrier layer (228) formed from a second material disposed over the first sidewall diffusion barrier layer, the second material different than the first material;

and

- a conductive plug (230) within the via.

With regard to claim 15, Huang discloses wherein the first metallization layer and the conductive plug include copper.

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With regard to claim 17, Huang discloses the first sidewall diffusion barrier is open to the first metallization layer.

4. Claims 14-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Geffken et al. (PN 5,985,762).

Geffken et al. discloses, as shown in Figure 3E, a semiconductive device comprising,

- a first metallization layer (21);

- a dielectric layer (23) disposed over the first metallization layer, the dielectric layer defining a via extending through the dielectric layer to the first metallization layer;

- a first sidewall diffusion barrier layer (28) formed from a first material disposed on sidewalls of the via;

- a second sidewall diffusion barrier layer (29) formed from a second material disposed over the first sidewall diffusion barrier layer, the second material different than the first material;
- and

- a conductive plug (30) within the via.

With regard to claim 15, Geffken et al. discloses wherein the first metallization layer and the conductive plug include copper.

With regard to claim 16, Geffken et al. discloses the first sidewall diffusion barrier is open to the first metallization layer.

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With regard to claim 17, Geffken et al. discloses the first sidewall diffusion barrier is open to the first metallization layer.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huang (PN 6,156,648).

Huang discloses all of the claimed limitations except the second etch stop layer has a thickness as claimed. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the second etch stop layer of Huang having a thickness as claimed because it is obvious to form the layer having a sufficient thickness to function as an etch stop to prevent layers formed below it to further etching.

6. Claims 6-8 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang (PN 6,156,648) in view of Geffken et al. (PN 5,985,762).

With regard to claims 6-7 and 16, Huang discloses the material of the first diffusion barrier layer includes silicon nitride. Huang does not disclose the sidewall diffusion barrier layer is formed from the same material as the first diffusion barrier layer (silicon nitride). However, Geffken et al. discloses a sidewall diffusion barrier layer and a first diffusion barrier layer formed from the

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same material (silicon nitride). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the sidewall diffusion barrier layer and the first diffusion barrier layer having the same material (silicon nitride), such as taught by Geffken et al. in order to simplify the process step.

With regard to claim 8, Huang and Geffken et al. disclose all of the claimed limitations except the first diffusion layer has a thickness as claimed. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the first diffusion layer of Huang having a thickness as claimed because it is obvious to form the layer having a sufficient thickness to function as a diffusion barrier to prevent the atoms from the metallization layer diffuse into the dielectric layer.

7. Claims 13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang (PN 6,156,648) in view of Taniguchi (PN 5,847,459).

Huang discloses all of the claimed limitations except the via has rounded corners. However, Taniguchi discloses forming a via that has rounded corners. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the via of Huang having rounded corners, such as taught by Taniguchi in order to improve the step coverage of the successively formed metallization layer.

8. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Geffken et al. (PN 5,985,762) in view of Taniguchi (PN 5,847,459).

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Geffken et al. discloses all of the claimed limitations except the via has rounded corners.

However, Taniguchi discloses forming a via that has rounded corners. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the via of Geffken et al. having rounded corners, such as taught by Taniguchi in order to improve the step coverage of the successively formed metallization layer.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (703) 308-4079. The examiner can normally be reached on Mon-Thurs 7:00-5:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

August 22, 2002

Steven Loke